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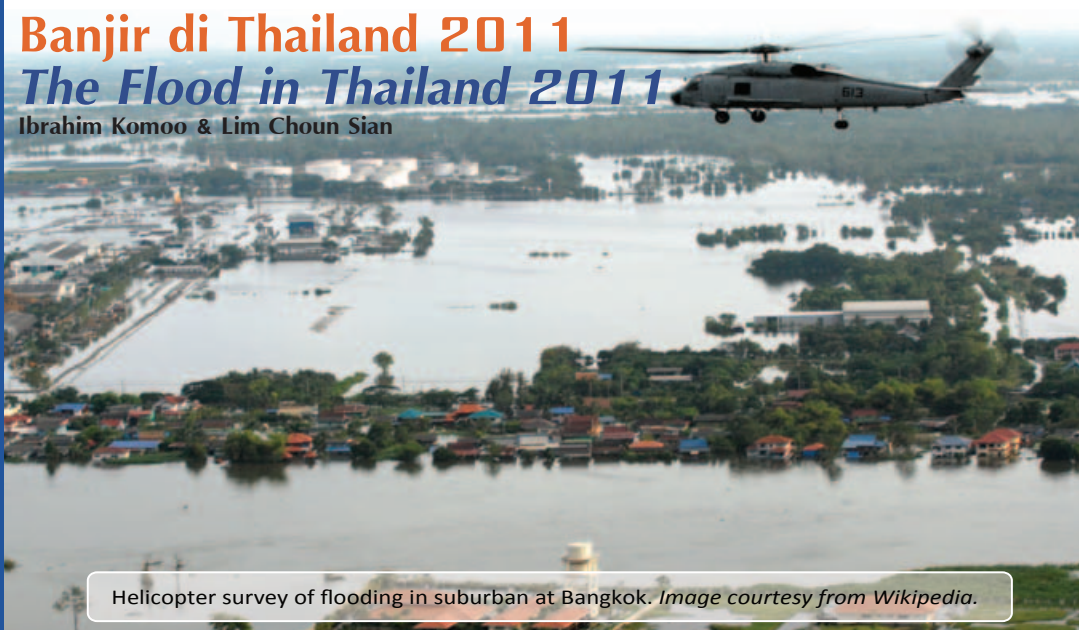
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Banjir di Thailand 2011 *The Flood in Thailand 2011*

Ibrahim Komoo & Lim Choun Sian



Helicopter survey of flooding in suburban at Bangkok. Image courtesy from Wikipedia.

Rantau Asia merupakan kawasan paling teruk dilanda malapetaka pada tahun 2011, antaranya negara Jepun, China, Myanmar dan Filipina. Di Thailand, Lembangan Sungai Chao Phraya yang menjadi pembekal beras utama telah dilanda banjir semenjak Julai 2011 dan berlarutan sehingga bulan Disember 2011. Bandaraya Bangkok yang ditenggelami air seolah-olah telah kelumpuhan. Bank Dunia menganggarkan kerugian ekonomi kepada Thailand sebanyak 1.4 trilion bath (US\$ 45.7 bilion), angka kerugian ekonomi ini adalah terbesar di dunia akibat bencana banjir dan kerugian keempat terbesar bagi malapetaka dunia. Kerugian akibat gempa bumi dan tsunami di Tohoku, Jepun yang juga berlaku pada bulan Mac tahun yang sama merupakan kerugian kewangan yang tertinggi akibat malapetaka. Sebanyak 58 wilayah Thailand dibanjiri dan meliputi seluas 6 juta hektar (45% keluasan Semenanjung Malaysia) permukaan Thailand, dari Chiang Mai di utara sehinggakan ke Bangkok yang terletak di hilir Sungai Chao Phraya. Sebanyak 684 orang terkorban dan 12.8 juta penduduk di negara tersebut terkena impak banjir.

Walaupun banjir besar tersebut berlaku di dalam negara Thailand tetapi kesannya juga dirasai ke serata dunia. Isu keselamatan bekalan makanan timbul apabila negara-negara terutamanya Asia yang makanan rujinya nasi membimbangi Thailand yang menjadi pengeksport beras utama mungkin tidak berupaya membekalkan beras, dan ini termasuklah Malaysia. Tidak ketinggalan, kilang-kilang industri pembuatan seperti Honda, Nikon dan Western Digital yang bertapak di negara tersebut turut dibanjiri.

Asia was among the worst hit region by disasters in the year 2011. Among the badly hit countries were Japan, China, Myanmar and the Philippines. In Thailand, north in the Chao Phraya Basin where the Asian Rice Bowl is situated, the region was devastated by floods since as early as July 2011, continuing till December 2011. It had brought the metropolis of Bangkok almost to a standstill. The World Bank estimated that economic loss was more than 1.4 trillion baht (US\$ 45.7 billion), one of the costliest floods in human history and the world's fourth largest disaster in terms of economic damage. The Tohoku Earthquake-Tsunami in March 2011 topped the list. The floods affected over 12.8 million people and a total of 684 people perished in the floods which also inundated 6 million hectares of land (45% of Peninsular Malaysia) and involved 58 provinces of Thailand from Chiang Mai in the North to parts of the capital city of Bangkok.

The world has become a global village and the impact of the disastrous floods in Thailand was worldwide. While Thailand is still the world's biggest exporter of rice, food security was among the primary concern of Asian countries which have rice as a staple food. Malaysia is among the many importers of rice from Thailand. Also, the giant industries such as Honda, Nikon and Western Digital where amongst the many production plants based in Thailand and were not spared. Disruptions in the production chain had impacted the world.

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Climatic Hazards

Strengthening Climate Change Adaptation: Supporting Continuous Science–Policy Engagement and Communication

Tan Ching Tiong



The National Symposium on Climate Change Adaptation officiated by Hon. Y.B. Dato Sri Douglas Uggah Embas, Minister of Natural Resources and Environment Malaysia.

The Climatic Hazards Programme of SEADPRI-UKM continued its active pursuance of research and outreach activities that span from the national and local levels to the regional and international platforms. Jointly with the Ministry of Natural Resources and Environment Malaysia and other organisations, SEADPRI-UKM successfully organised the first National Symposium on Climate Change Adaptation on 16-17 November 2011 in Putrajaya, Malaysia. The National Symposium is an activity of the Working Committee on Adaptation under the Green Technology and Climate Change Council, aimed to understand the goals and aspirations for climate change adaptation in various sectors to consolidate support from partner institutions. In addition to the top-down perspective of policy papers to provide inputs in framing sectoral adaptation initiatives and local level action, it also showcased some of the local level experiences in adaptation through research papers.

SEADPRI-UKM organised its annual flagship event for 2011 – SEADPRI Forum – on 29 September 2011 at Puri Pujangga, UKM Bangi. The Forum was jointly organised with the Ministry of Natural Resources and Environment Malaysia and the Institute for Environment and Development (LESTARI-UKM). This year the Forum was entitled "Climate, Environment and Development in Southeast Asia: Priorities and Challenges". The aim was to update current work in the Association of Southeast Asian Nations (ASEAN) and understand the regional needs and gaps for capacity building.

The lead speaker was Dr. Raman Letchumanan, Head of the Environment Division at the Association of Southeast Asian Nations (ASEAN) Secretariat. Dr. Raman shared insights on navigating environmental diplomacy to encourage regional collaboration and mobilise research support for ASEAN.

Internationally, SEADPRI-UKM researchers participated in two activities by the political and scientific platforms on climate change respectively. Mr. Tan Ching Tiong joined the national delegation to the United Nations Climate Change Conference on 28 November to 9 December 2011 in Durban, South Africa. Prof. Dr. Joy Jacqueline Pereira, as one of the Coordinating Lead Authors for the Asia Chapter of the IPCC Fifth Assessment Report, took part in the Second Lead Authors Meeting on 12-15 December 2011 in San Francisco, USA.

Intergovernmental Panel on Climate Change (IPCC): Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)

The IPCC-SREX, which was approved in November 2011, examines in detail the relationship between disaster risk management and climate change adaptation. The report covers issues that range from the links between climate change and extreme weather and climate events ("climate extremes") to the implications of these events for society and sustainable development. It states that extremes (such as the warming of extreme daily minimum and maximum temperatures, the intensification of extreme precipitation and increasing extreme coastal high water due to increase in mean sea levels) have changed as a result of anthropogenic influences. The report calls for the strengthening of national and sub-national systems to address climate change and integration of disaster risk management and climate change adaptation. Effective strategies and policies should take into account multiple stressors, different prioritised values, and competing policy goals. SEADPRI-UKM is proud to report that a researcher contributed to the report as the Review Editor of Chapter 7.

Geological Hazards

Seminar and Workshop on the Development of Rock Mass Classification in Wet Tropical Regions

Edy Tonnizam Mohamad

The seminar was held on 12th November 2011 at Universiti Tenaga Nasional (UNITEN). The seminar focussed on issues and challenges in rock mass classification in wet tropical regions in Malaysia. The event was organised by NatROCK (the National Tropical Rock Engineering Research Group), the International Association of Engineering Geologists National Group (Malaysia Chapter), the Southeast Asia Disaster Prevention Research Institute (SEADPRI-UKM), the Centre of Forensic Engineering (CEFE), College of Engineering, UNITEN, Geotechnical Engineering and Sustainable Management (myGERMAC), the Institute of Infrastructure Engineering and Sustainable Management, the Faculty of Civil Engineering, UiTM and the Department of Geotechnics and Transportation, Faculty of Civil Engineering, UTM. This event received an overwhelming response from academicians, industries, and practitioners with a total of 98 participants from all over Malaysia.

The main aim of the seminar was to address the issues and response on Rock Engineering/Classification in Malaysia while promoting a good working practice in Tropical Rock Engineering.

Besides that, the seminar aimed to become a platform to develop national collaboration among the experts in the country to help the nation face problems with rock-engineering related issues. The need for better understanding of the challenges of rock sciences and engineering in tropical climates is crucial, considering that, to date, there are a lot of unaddressed issues related to environmental safety and engineering sustainability.

Eight papers were presented during the seminar as shown in the table below. The issues revolved around tropical rock weathering, mechanics of weak/weathered rocks, engineering technology and tropical geohazards. The workshop is an initial effort to bring together academicians, researchers, geologists, geotechnical engineers, practitioners, postgraduate students and any individuals who are willing to share his/her research findings, knowledge and experiences working with weak and weathered rock materials and rock masses. In the afternoon, workshop was held to discuss relevant matters. It was chaired by Prof. Dato' Dr. Ibrahim Komoo. The panel members involved were Assoc. Prof. Dr. Tajul Anuar Jamaluddin, Prof. Dr. Abd. Ghani Rafek, Prof. Dr. Zainab Mohamed and Dr. Edy Tonnizam Mohamad.



Some of the participants attended the Seminar and Workshop on the Development of Rock Mass Classification in Wet Tropical Regions, 12 November 2011 at UNITEN.

Presenters	Topic
Prof. Dato' Dr. Ibrahim Komoo	Tropical Rock Mass Characterisation for Slope Stabilisation Problems
Assoc. Prof. Dr. Tajul Anuar Bin Jamaluddin	Rock Slope Stabilisation & Protection Measures - Some Comments on Common Practices in Malaysia
Rock Slope Stabilisation & Protection Measures - Some Comments on Common Practices in Malaysia	Quantifying Dynamic Properties of Weathered Rock for Engineering Design: Issues and Challenges
Prof. Dr. Abdul Ghani Rafek, T.L.Goh, & Mohd. Hariir Arifin	An Approach to the Quantification of Roughness of Geological Discontinuities
Dr. Rohayu Che Omar	Application of ESA Concept in Route Selection
Dr. Edy Tonnizam Mohamad, Seyed Vahid Alavi, Maybelle Liang & Siti Norsalkini	Engineering Classification of Rock Mass in Wet Tropical Region
Assoc. Prof. Ir. Dr. Azaman Kassim	Effect of Relict Discontinuities on Water Flow in Heterogeneous Residual Soil

Technological Hazards

Biohazards: Biorisk Management

Lee Yook Heng

The rapid development in biotechnology and medical sciences has opened many opportunities in direct contact with microbes, especially pathogenic organisms. The handling of these biohazards, especially in bioscience laboratories calls for the management of their safety and security risks (biorisk) in a responsible manner where the implementation of a unified laboratory biorisk management framework is necessary. Managing biological safety and security risks can be a difficult and costly task. A comprehensive system should incorporate both policy and management aspects. Ultimately the goal of a biorisk management system should be to ensure an organisation's biorisk management objectives are met in the most efficient and effective ways to enhance biosafety and biosecurity. The ideal biorisk management should integrate authorities, the public, and the scientific community in order to establish trust and societal safety and security, while allowing the continued progress of science.

In general, a risk management framework consists of seven main phases including pre-assessment, risk assessment, concern assessment, risk characterisation, risk evaluation, decision making, and implementation. In sustainable biorisk management, knowledge and skills are needed to make decisions on (1) launching of activities that imply some level of biorisk, (2) the design and construction of the biocontainment facilities for further activities, and (3) the management of laboratory biorisks during the operational activities. Technically, biorisk assessment can be performed in two-steps: (1) the hazard or risk identification involving the characterisation of the biological agents or materials and the evaluation of their potential impact, and (2) a risk analysis of the activities. The result of the risk assessment determines the biological containment level that is required, together with possible additional measures aiming at protecting personnel, the external community and the environment.

However, some important aspects that are essential to a good biorisk management system will encompass risk identification, risk assessment, biorisk management policies, roles and responsibilities of personnel, operational risk mitigation measures, inventories, waste management, incident response planning, and biorisk management reviews. Some examples of essential risk mitigation measures are barriers, personnel protective equipment and access controls in biorisk facilities. The establishment of a good biorisk management framework will require a clear definition of assets that are capable of acting as resources for risk governance. These assets can be in the form of knowledge bases and structural conditions for effective management. Assets may be subdivided into four categories (1) rules, norms, regulations; (2) resources; (3) competencies and knowledge and (4) organisational integration. These assets will determine whether an organisation has the ability in biorisk assessment and to control risks. But organisational integration capacity forms the key element without which the framework will not be effective.



As far as the institutional level is concerned, a biorisk policy must be formulated, which addresses and shapes the overriding commitment from top down. Whatever policy that is formulated, it should be endorsed by the executive management. At the operational level, a customised biorisk management system should be subsequently developed, implemented and continually audited. This can only be successfully implemented if educational and awareness raising activities are performed to ensure a better understanding, compliance and ownership from everybody involved at bottom up level. The level of regulation by authorities should be proportional to the degree of risks. A good understanding across sectors and communities will enable the level of regulation to be achieved and this should provide a meaningful level of control that fits the daily operations of the biorisk facilities.

The management of biorisk is crucial in developing countries such as Malaysia where new activities involving biological pathogens are frequently launched without the establishment of a comprehensive regulatory environment and a pool of biorisk management expertise. There are obvious gaps in the training and personnel reliability programmes appropriate to biorisk management, particularly obvious gaps in some academic settings. In view of the need of trained human resources and research in the field of biorisk and management, the Technological Hazard Programme of SEADPRI will focus on this field of study in the near future to provide both knowledge and manpower requirements for the safe and secure handling of biohazards in the country to prevent the possible occurrence of biohazard related disasters. A research grant from MOSTI has already been acquired by the Technological Hazard Programme to carry out research in biohazard detection under RMK-10 of funding. This initial funding will propel the beginning of biohazard research in SEADPRI.

Activities

The Asian Conference on Disaster Reduction 2011 (ACDR2011)

Lim Choun Sian



Participants at the ACDR 2011. Image courtesy from ADRC.

The Asian Conference on Disaster Reduction (ACDR) 2011 was held in Colombo, Sri Lanka, 13th to 15th June 2011 with the participation of over 120 delegates, including officials from 27 governments, 26 international and regional organisations, academic communities, the private sector and community based organisations. Malaysia as a member country in the Asian Disaster Reduction Center (ADRC) was represented by Safrul Faiz Ab Satar (the National Security Council), Lim Choun Sian (the Southeast Asia Disaster Prevention Research Institute (SEADPRI-UKM)) and Abd Malik Tussin (the Malaysian Meteorological Department). Strong emphasis was made in the conference on the importance of strengthening the region's commitment to disaster risk reduction as a priority agenda of national and local governments with a clear vision and policy.

A Special Session on integration of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) as was the highlight of the event.

ACDR2011 reiterated the importance of its member countries on investing in DRR through Local Action and the Hyogo Framework for Action 2005-2015 (HFA) to further accelerate the implementation of HFA on integrating DRR into CCA as well as presenting a regional road map for promoting regional cooperation on DRR through CCA. The conference looked forward to the forthcoming 5th Asian Ministerial Conference on Disaster Reduction (5AMCDRR) to be held in Yogyakarta, Indonesia in 2012 where the theme is "Strengthening Local Capacity in DRR".

Sambungan dari mukasurat 1

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Implikasinya, bekalan produk yang dipasarkan ke seluruh dunia mungkin terganggu untuk jangka masa singkat.

Beberapa punca dikemukakan untuk menerangkan kejadian banjir Thailand 2011. Kawasan yang dibanjiri ini terdiri daripada delta memanjang sehingga ke muara dengan permukaan bumi yang rendah dan rata, parasnya terletak hanya 1 hingga 3 meter di atas paras laut. Tambahan pula, pengambilan air bawah tanah secara berlebihan sejak 3 dekad yang lalu juga menyebabkan permukaan tanah di beberapa tempat di Bangkok telah mendap sehingga 1 meter. Punca lain seperti jumlah hujan yang ekstrem dan pembangunan mendadak juga dipercayai menyumbang kepada kejadian banjir.

Banjir dan bencana-bencana lain bukan masalah yang terhad kepada satu negara atau rantau tetapi semua negara. Walaupun sesetengah bencana tidak dapat dielakkan tetapi risikonya dapat dikurangkan jika persediaan awal untuk pencegahan dilaksanakan. Perancangan awal menggunakan kerangka pengurangan risiko bencana (DRR) yang terkamil dalam agenda utama negara pendekatan mengurus risiko bencana seharusnya dipraktikkan oleh semua negara dan bandar. Praktik DRR melibatkan perancangan dan adaptasi terhadap perubahan alam sekitar dan pada masa yang sama membina kerentanan sesebuah bandar dan penghuninya merentasi setiap peringkat kesediaan awal, pemulihan dan respons terhadap bencana.

There were several reasons that caused the floods. The low-lying land topography that ranges only 1 – 3m above mean sea level in the deltaic cities near the coastal mouth and extensive land subsidence caused by over extraction 3 decades ago had sunken the land more than 1m in some parts of the country. These are among some of the reasons that caused the floods. Others are the extreme rainfall and over development.

The scenario of floods and other disasters is not the problem confined to only one country or region but also other countries as well. While some natural hazards may be unavoidable, the risk could be significantly reduced if prior steps were taken to mitigate them. The adoption of a Disaster Risk Reduction (DRR) framework with integration into every country's priorities is viewed as one of the approaches in managing disasters. The DRR will involve planning and adaptation for environmental change and building the resilience of the cities and the people including preparedness, recovery and response.

Activities

First Global Summit of Research Institutes for Disaster Risk Reduction Disaster Prevention Research Institute (DPRI), Kyoto University, Japan 24th – 25th November 2011

Ibrahim Komoo

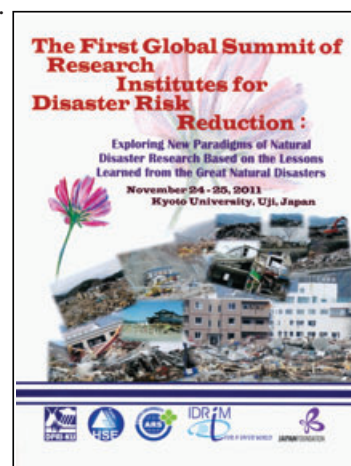
Representatives from 25 research institutes in 11 countries met in Kyoto, Japan and discussed the current scenario of disaster risk reduction (DRR), major challenges for implementation, and explored new paradigms for DRR. Malaysia was represented by the Director, Southeast Asia Disaster Prevention Research Institute (SEADPRI), Universiti Kebangsaan Malaysia.

At the end of the summit, the delegations agreed on the responsibility to address the evolving issues associated with saving lives and reducing economic losses caused by natural disasters. Major recommendations based on the resolution were:

1. The establishment of global platforms to enhance studies of disaster risk reduction for short, mid- and long-term planning
2. The implementation of interdisciplinary approaches which strive to meaningfully combine efforts in technological innovations, applications, governance and education

3. The publication and distribution of timely research findings that promote open communication among researchers, government agencies, international committees, private sector groups and other groups working in natural hazards.

This summit marks the first attempt to bring together leaders of research institutes to deliberate DRR issues from the institutional perspective. This is a significant breakthrough in the mind set, and SEADPRI would like to congratulate DPRI Kyoto University for taking the bold effort in engaging discussions at the institutional level.



SEADPRI's Participation in the IPROMO Summer Course 2011

Lim Choun Sian

A total of 28 participants from different regions namely Columbia, Bolivia, Venezuela, Panama, Romania, Ethiopia, Russia, Tajikistan, Uzbekistan, Nepal, Bangladesh, Pakistan, Malaysia, Indonesia, and Italy were represented at the fourth International Programme on Research and Training on Sustainable Management on Mountain Areas (IPROMO) course 2011 in Ormea, Italy, on natural disasters. Malaysia was represented by Lim Choun Sian of the Southeast Asia Disaster Prevention Research Institute (SEADPRI), Universiti Kebangsaan Malaysia.

The programme was conceived and organised by the Mountain Partnership Secretariat of the Food and Agriculture Organization of the United Nations (FAO), UNESCO, within the framework of the UN Decade of Education for Sustainable Development and the University of Turin.

The theme "Natural Hazards and Disaster Risk Management in Mountains" for this course, aimed at sustainable mountain development and provided participants with scientific knowledge about natural hazards in mountain areas, the high vulnerability of mountain communities and to enhance their ability to assess potential ecological and social impacts of disaster risk management policies.

Experience and case studies on how policy makers, UN negotiation processes and others involved in disaster risk management were also shared by the instructors and UN officers during the course. IPROMO 2011 was a good platform for institutional collaboration between participants representing various countries on dealing with Disaster Risk Reduction for mountainous regions.

Activities



Adaptation Agendas Moving Forward in the 2011 United Nations Climate Change Conference

Tan Ching Tiong

The 2011 United Nations Climate Change Conference was held on 28th November to 11th December, 2011 in Durban, South Africa. The conference involved a series of events, including the COP 17, CMP 7, AWG-LCA 14 (resumed), AWG - KP 16 (resumed), SBI 35 and SBSTA 35. About 12,500 participants from around the world attended the conference. Delegates from Malaysia were led by the Ministry of Natural Resources and Environment and comprised representatives of several organisations. The Southeast Asia Disaster Prevention Research Institute (SEADPRI-UKM) was represented by Mr. Tan Ching Tiong, Research Officer, to provide technical supports on adaptation issues.

The meetings resulted in the adoption of 19 COP decisions and 17 CMP decisions and the approval of a number of conclusions by the subsidiary bodies. Among all, the decisions on adaptation agendas critical to Malaysia include the National Adaptation Plan, Loss and Damage, and the Nairobi Work Programme.

The decision on the National Adaptation Plan invites developing country parties to employ the modalities for national adaptation plans. The Adaptation Committee is requested to consider supports to interested developing countries in planning, prioritising and implementing their national adaptation planning measures.

The decision also invites operating entities of the financial mechanism of the Convention to provide financial and technical support. The decision on approaches to address loss and damage associated with climate change impacts in developing countries set out a work programme on loss and damage. The SBI was requested to continue the implementation of the work programme and address questions in the annex. Countries and relevant organisations were invited to consider the decision and engage experts in undertaking work under the thematic areas. It also recognises the need to explore a range of possible approaches and potential mechanisms, including an international mechanism, to address loss and damage.

The decision on the Nairobi Work Programme (NWP) requested SBSTA to reconsider the NWP work areas with a view to making recommendations to COP 19 on how to best support the objectives of the NWP. Countries were invited to submit views on potential areas of future work under the NWP before by 17th September 2012.

The Secretariat will organise workshops on water and climate change impacts and adaptation strategies, and on ecosystem-based approaches as well as compile case studies on national adaptation planning processes.

SEADPRI-UKM FORUM III 2011 Climate, Environment and Development in Southeast Asia: Priorities and Challenges 29th September 2011, Puri Pujangga, UKM Bangi

Mohd Khairul Zain bin Ismail



This year the SEADPRI-UKM Forum 3 2011 was entitled "Climate, Environment and Development in Southeast Asia: Priorities and Challenges", held on 29th September 2011 at Puri Pujangga, UKM Bangi. The aim was to update current work by the Association of Southeast Asian Nations (ASEAN) and to understand the regional needs and gaps for capacity building. The Forum was jointly organised with the Ministry of Natural Resources and Environment (NRE) and the Institute for Environment and Development (LESTARI-UKM). More than 50 participants attended the Forum, mainly experts from government,

universities, scientists, economists, academicians, and non-governmental organisations (NGOs), whose common agenda is to address the issue of climate, environment, and development, in the context of disaster prevention and sustainability at the regional level. The Forum was moderated by Raja Datuk Zaharaton Raja Zainal Abidin, Visiting Scholar of LESTARI-UKM and the lead speaker was Dr. Raman Letchumanan (picture), Head of the Environment Division at the ASEAN Secretariat. Dr. Raman shared insights on navigating environmental diplomacy to encourage regional collaboration and mobilise research support for ASEAN.

Bencana Aliran Debris 7 Ogos 2011, Sungai Ruil, Cameron Highland

Lim Choun Sian & Ibrahim Komoo



Bencana aliran debris di perkampungan orang asli Sungai Ruil, Cameron Highland. *Image by Lim Choun Sian*

Bencana Aliran Debris yang berlaku di perkampungan orang asli di Sungai Ruil pada 7 Ogos adalah peristiwa geobencana di Malaysia yang telah meragut nyawa. Kejadian ini telah menyebabkan 4 buah rumah musnah, nyawa terkorban dan 2 mangsa cedera parah. Aliran Debris merupakan satu jenis gelinciran tanah yang sangat merbahaya kerana pergerakan debris yang pantas dan sukar diramal. Kejadian aliran debris lepas, umpamanya di Genting Sempah (1995) mengorbankan 20 nyawa; Pos Dipang (1996) mengorbankan 44 nyawa; dan Gunung Pulai (2001) telah mengorbankan 20 nyawa.

Aliran debris lazimnya berlaku di sepanjang aliran sungai di bahagian hulu sungai di kawasan pergunungan. Ia selalunya bermula daripada peristiwa tanah runtuh, diikuti oleh bahan debris (tanah, bongkah batuan dan tumbuhan) masuk dan bercampur dengan air sungai. Bahan debris yang bercampur dengan air berupaya menghakis tebing sungai dan membawa turun dengan pantas dan diendapkan dibahagian lembah yang landai.

Di Sungai Ruil, tanah runtuh bersaiz sederhana (isipadu debris sekitar 1,500 meter padu) menjadi pemula kepada bencana ini. Debris yang bergerak sejauh lebih 130 meter berupaya menghakis tebing sungai sehingga berjaya mengumpul debris dengan isipadu melebihi 5,000 meter padu, dan akhirnya menimbus 4 rumah yang berada di kaki aliran tersebut. Akibat pergerakan yang pantas, rumah yang berada di laluan tersebut musnah dan tertimbus pada kedalaman 5 meter.

Walaupun sukar menentukan bila bencana akan berlaku, kawasan berpotensi aliran debris boleh dipetakan dan zon risiko dikenalpasti. Lazimnya kawasan yang pernah mengalami aliran debris menunjukkan kesan hakisan tebing dan zon pengendapan debris yang jelas. Bagaimanapun, Malaysia masih belum mempunyai organisasi pelaksana untuk memeta, memantau dan mengeluarkan amaran untuk menghindar atau mengurangkan risiko bencana seumpama ini.

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